

7-1-2013

IT And Collaboration In Service Innovation: A Dynamic Capability Perspective

Ralf Plattfaut

University of Muenster - ERCIS, Münster, NRW, Germany, ralf.plattfaut@ercis.uni-muenster.de

Björn Niehaves

University of Münster, ERCIS, Münster, NRW, Germany, bjoern.niehaves@ercis.uni-muenster.de

Matthias Voigt

University of Münster, ERCIS, Münster, NRW, Germany, matthias.voigt@ercis.uni-muenster.de

Andrea Malsbender

University of Münster, ERCIS, Münster, NRW, Germany, andrea.malsbender@ercis.uni-muenster.de

Kevin Ortbach

University of Muenster - ERCIS, Münster, Germany, kevin.ortbach@ercis.uni-muenster.de

See next page for additional authors

Follow this and additional works at: http://aisel.aisnet.org/ecis2013_cr

Recommended Citation

Plattfaut, Ralf; Niehaves, Björn; Voigt, Matthias; Malsbender, Andrea; Ortbach, Kevin; and Pöppelbuß, Jens, "IT And Collaboration In Service Innovation: A Dynamic Capability Perspective" (2013). *ECIS 2013 Completed Research*. 152.
http://aisel.aisnet.org/ecis2013_cr/152

Authors

Ralf Plattfaut, Björn Niehaves, Matthias Voigt, Andrea Malsbender, Kevin Ortbach, and Jens Pöppelbuß

IT AND COLLABORATION IN SERVICE INNOVATION: A DYNAMIC CAPABILITY PERSPECTIVE

Plattfaut, Ralf, European Research Center for Information Systems, University of Muenster, Leonardo-Campus 3, 48149 Muenster, Germany, ralf.plattfaut@ercis.uni-muenster.de

Niehaves, Bjoern, Hertie School of Governance, Friedrichstraße 180, 10117 Berlin, niehaves@hertie-school.org

Voigt, Matthias, European Research Center for Information Systems, University of Muenster, Leonardo-Campus 3, 48149 Muenster, Germany, matthias.voigt@ercis.uni-muenster.de

Malsbender, Andrea, European Research Center for Information Systems, University of Muenster, Leonardo-Campus 3, 48149 Muenster, Germany, andrea.malsbender@ercis.uni-muenster.de

Ortbach, Kevin, European Research Center for Information Systems, University of Muenster, Leonardo-Campus 3, 48149 Muenster, Germany, kevin.ortbach@ercis.uni-muenster.de

Poeppelbuss, Jens, Institute for Information Management Bremen (ifib), University of Bremen, Am Fallturm 1, 28359 Bremen, jepo@informatik.uni-bremen.de

Abstract

In today's networked service economy, it becomes essential for service firms to continuously innovate their service offering to remain competitive in constantly changing market conditions. Many successful firms collaborate with external partners and utilize contemporary information technology (IT) support to integrate dispersed service innovation capacity and knowledge. In this paper, we develop and test a theoretical framework that explains how IT and collaboration can contribute to developing service innovation capability. Drawing on dynamic capability theory, we differentiate between sensing, seizing, and transformation abilities in service innovation. With our theoretical model, we can explain as much as 65% of the variance in service innovation success ($R^2=.647$) and provide evidence of the multi-faceted and significant effects of IT and collaboration. Especially in the phase of turning first ideas into operational service innovation concepts, IT and collaboration are of great importance for service innovation success.

Keywords: Service Innovation, Dynamic Capabilities, Quantitative Study, Survey.

Acknowledgements

This paper was written in the context of the research project KollaPro (promotional reference 01FL10004) funded by the German Federal Ministry of Education and Research.

1 Introduction

Innovation in the service economy, often referred to as service innovation, has become a focal point of attention for service organizations. Service design and development issues are increasingly recognized as important to managers (Menor et al. 2002). A plethora of methods and tools has been developed in the context of service innovation, including service blueprints (Shostack 1982) or lean management (Abdi et al. 2006). However, the development of new services is still considered to be “among the least understood topics in the service management and innovations literature” (Menor & Roth 2007). More specifically, not much research has yet been undertaken to derive a framework that depicts the constituting elements of service innovation (Den Hertog et al. 2010). In this regard, Chae (2012) states that “a theory-based, yet practical framework or model is not readily available.”

Collaboration has been identified as an important factor influencing innovation processes in organizations (Chesbrough 2011). Especially in fast changing environments, “complementary knowledge is needed in breeding innovative ideas for products and services” (Blomqvist & Levy 2006). Managers are increasingly aware that no single firm has enough knowledge or human resources to efficiently create superior services. Thus, firms are likely to collaborate with partners, e.g., along the supply chain (Lusch et al. 2009). While there have been several studies on the influence of collaboration on innovation performance (e.g., Capaldo 2007), they only address innovation as a rather generic concept. It remains unclear for which particular abilities (e.g., idea generation, planning, or change management) within the innovation process collaboration may be most beneficial. Similarly, the effects of information technology (IT) use on organizational innovation abilities are also under-researched (Kleis et al. 2011). While there is agreement upon the importance of IT for innovation processes (e.g., Doherty & Terry 2009), not much effort has yet been undertaken to study the effects of IT use on different innovation abilities.

With this paper, we seek to address the presented research gaps and, thus, contribute to an improved theoretical understanding of service innovation. We specifically elaborate on potential effects that IT use and collaboration exert on the success of different abilities typically employed during the service innovation process. To this end, we develop an understanding of service innovation based on dynamic capability theory and present a comprehensive framework of the abilities employed in the service innovation process. Thereby, we tie in with recent studies on dynamic capabilities in service innovation (Fischer et al. 2010; Den Hertog et al. 2010; Plattfaut et al. 2012). Based on this theoretical understanding, we build and validate a research model that covers the effects of collaboration and IT use on service innovation success. We thus contribute a deeper understanding of service innovation as a dynamic capability and give arguments for the importance of collaboration and IT support.

The remainder is structured as follows: Next, we present our theoretical understanding of service innovation as a dynamic capability and elaborate on related work in this area (Section 2). Then, we present our research model (Section 3). In Section 4, we set out our research methodology. Section 5 covers the preliminary results of our quantitative study. This paper closes with an interpretation of the results, a concluding discussion, and an outlook on further promising research steps (Section 5).

2 Theoretical Background

Organizations need to focus on innovation in order to stay competitive and to react on changing customer needs and expectations. In doing so, organizations are able to raise both the quality and productivity level of their services (Das & Canel 2006). In line with previous research (Pöppelbuß et al. 2011), the dynamic capability theory (DCT) can be used as a meaningful theoretical perspective on service innovation (Agarwal & Selen 2009; Den Hertog et al. 2010). DCT offers an extension to the resource-based view (RBV). The RBV considers two types of resources that organizations may possess: First, *capabilities* are repeatable patterns of actions (or, processes) that make use of assets as

inputs (Helfat & Peteraf 2003; Wade & Hulland 2004). Second, *assets* are defined as anything tangible or intangible which are used by organizations to design, implement and/or offer a new service or product to the market (Wade & Hulland 2004). In order to stay competitive, the DCT argues that organizations must react on environmental changes and thereby adapt their resource configuration. For this adaptation, a specific kind of capabilities, i.e., dynamic capabilities, is needed (Eisenhardt & Martin, 2000; Zollo & Winter, 2002). Hence, two types of capabilities can be distinguished: on the one hand, there are capabilities that the organization depends on to conduct its daily business, like procurement, order fulfillment, or marketing. These are called *operational capabilities* (Helfat & Peteraf 2003). On the other hand, *dynamic capabilities* enable an organization to integrate, build, and reconfigure its operational capabilities and, thus, to react on changing requirements in the market environment. In line with prior research, we define dynamic capabilities as organizational routines to achieve new resource configurations in order to match market environments (Eisenhardt & Martin 2000; Teece et al. 1997). Hence, an organization's service innovation capability can be understood as a dynamic capability.

In a service economy, service provision is daily business for most firms. Hence, we view service provision as an operational capability, while service innovation is the corresponding dynamic capability. We define service innovation as the organizational routines that build new services to achieve a fit with changing environments. Den Hertog et al. (2010) present a framework that depicts the six constituting elements of service innovation including A) signalling user needs and technological options, B) conceptualising, C) (un-)bundling, D) (co-)producing and orchestrating, E) scaling and stretching, and F) learning and adapting. These elements can be partly mapped to our conceptualization as we consider that service innovation as a dynamic capability relies on sensing (A, D), seizing (B, C) and transformation (E) abilities (Teece 2009) while learning and adapting (F) is inherent to the dynamic capability concept as a whole.

Sensing is the ability to identify needs to change existing service processes or opportunities to innovate services. Seizing means to explore and select feasible service opportunities, whereas transformation concentrates on the actual implementation of a new or modified service into the organization. Each of these abilities manifests in activities to be accomplished by the organization. We consider sensing to involve the activities of scanning, evaluating, and detailing. Scanning is a process of "continuously and deliberately discovering and surfacing new and useful problems to be solved" (Basadur et al. 2000). Evaluation involves the examination of such impulses, including an initial decision on whether further detailing should be conducted (Chai 2005). In detailing, side conditions are elaborated and the problem is further mapped out (Chai 2005). Seizing addresses solution development, solution evaluation and selection, as well as solution detailing. Solution development refers to the generation of different service solutions, i.e. to service process design (Das & Canel 2006) and concept development (Cowell 1988). Solution evaluation and selection covers the informed decision making process of an organization (Dreu et al. 2001), resulting in the selection of the most adequate solution. Solution detailing focuses on a final description of the procedures, infrastructures, and behaviors which are needed for service innovation (Johnes & Storey 1998; Stevens & Dimitriadis 2005). Following Lewin and Cartwright (1951), the last ability, transformation, consists of unfreezing, changing, and (re-)freezing activities. Unfreezing refers to the disruption of existing work processes by communicating new work structures. Specific aspects of acceptance and usability of the new processes are at focus. The changing activity includes the implementation of the new service. Typically, a new service is launched using prototypes or limited user groups before being introduced to the public (Bowers 1989). Finally, freezing focuses on the institutionalization of the new service innovation, e.g., by training the people who are supposed to provide the new service in the end (Bashein et al. 1994).

For each activity, external influences, e.g., from partners or customers, play an important role. Especially in the context of innovation, collaboration is an essential factor that enables organizations to make use of valuable resources not available in-house and, thereby, to explore new opportunities and forestall innovations from competitors (Agarwal & Selen 2009). Collaboration can be understood

as “a process of decision making among interdependent parties; it involves joint ownership of decisions and collective responsibility for outcomes” (Liedtka et al. 2011). Chatterjee et al. (2002) outline the relevance of collaborative ties stating that intra- and inter-organizational linkages are needed for successful idea sharing, for pooling of scarce resources (physical and intellectual), and for the streamlining of business processes.. Furthermore, in dynamic market environments, open innovation has been established as a major paradigm for innovation success by which knowledge gained from the external is used to accelerate internal innovation (Chesbrough et al. 2006).

In the last decades, service innovation has been strongly determined by technological assets. Technological assets are one important class of assets being used by dynamic capabilities (Teece et al. 1997). Ravichandran and Lertwongsatien (2005) verify this by providing an empirical study, showing that the positive impact of IT support on firm performance is mediated by the impact on the core competencies, or core business processes respectively, of an organization. This finding especially underlines the importance of IT support for dynamic capabilities. While literature on information system innovation agrees in the high relevance of IT for service innovation in general, less is known about the differentiated impact of IT support during the service innovation process. Particularly, existing research concentrates on the general role of IT in organizational innovation, e.g., by concentrating on different types of information system innovation (Swanson 1994).

Collaboration within the service innovation process is supported by IT-based networks which can enable an organization to gain access to specialized knowledge (Thomke 2006). In a study on the impact of collaborative IT on dynamic capabilities, Pavlou and El Sawy (2010) show that project and resource management systems, organizational memory systems, and cooperative work systems explain 41% of dynamic capabilities in new product development. Zammuto et al. (2007) highlight the relevance of IT for collaborative organizations by presenting different organizational abilities (i.e. virtual collaboration ability or mass collaboration ability) that can result from the intersection of technology and organizational features. They state that “it does not make sense to study the dynamics of human behavior within organizations without taking into account how information technologies might affect it”. Yet, empirical evidence for this is missing.

3 Research Model

Based on the aforementioned theoretical background, we synthesize our research model, addressing the constructs, their measurement, and their relationships.

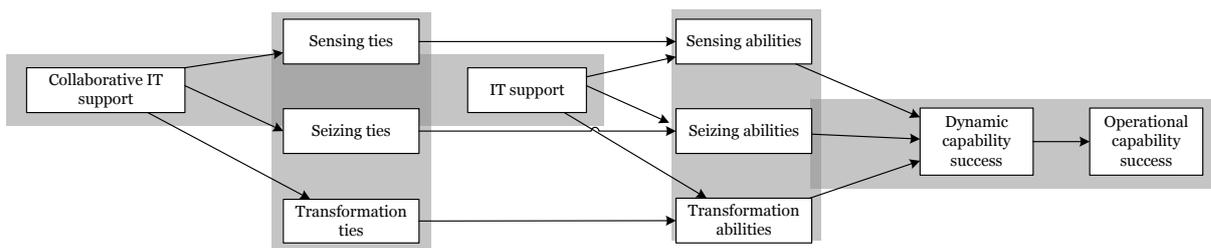


Figure 1. Research Model

As to the constructs and their relationship (Figure 1), we make three central sets of theoretical hypotheses: first, we assume that an organization’s abilities in sensing, seizing, and transformation have a positive impact on its dynamic capability success, i.e., on its service innovation success. This is grounded in the understanding of dynamic capabilities as presented by (Teece 2007). We further assume that dynamic capability success in turn has a positive impact on the operational capability, i.e., service success. This hypothesis is also grounded in DCT (Teece et al. 1997): given an organization that is successful in performing its dynamic capabilities, it will be successful in discovering market threats and opportunities (sensing), conceptualize solutions (seizing), and implement those solutions in

new service operations (transformation). In consequence, the new service should lead to high market fit, be designed appropriately, and implemented successfully. In other words, the new service, or the operational capability, is expected to be successful.

Second, we take the stance that collaboration plays an important role in service innovation. Thus, we hypothesize that the strength of collaborative ties in sensing (sensing ties), seizing (seizing ties), and transformation (transformation ties) has a positive impact on the corresponding abilities. Collaboration was found to have a positive impact on creating abilities for change (Grant 1996; Teece et al. 1997). Especially in the context of innovation, collaboration is an essential factor that enables organizations to make use of valuable resources not available in-house. New opportunities can be explored in order to forestall innovations from competitors (Agarwal & Selen 2009).

Third, we are convinced that IT plays an important role in service innovation. Thus, we hypothesize that IT for sensing, seizing, and transformation (IT support) has a positive impact on the three abilities. Investigations show that IT capabilities, defined as a conglomerate of IT infrastructure, human IT resources, and IT-enabled intangibles, have a positive impact on profit and cost-based performance of firms (Bharadwaj 2000). From an organizational perspective, IT supports business processes which lead to increased business process performance and eventually organizational performance (Melville & Kraemer 2004). Moreover, we assume a positive impact of collaborative IT (Collaborative IT support) on the strengths of collaborative ties in sensing, seizing, and transformation. We admit that IT support for sensing, seizing, and transformation may encompass collaborative functionality. However, our items (see Table 1) for both kinds of IT support reflect a different emphasis each: IT support specifically addresses tool adequacy for the task service innovation, while collaborative tools support has an emphasis on the tool adequacy for the task of collaboration with external partners.

The remainder of this section is dedicated to the measurement of the constructs. Sensing abilities (SN) are considered to be present, if the service provider is capable in performing the activities of scanning (SN1), evaluating (SN2), and detailing (SN3) (Basadur et al. 2000; Chai 2005). Seizing abilities (SZ) are practiced, if the service provider is capable to perform the activities of solution development (SZ1), solution evaluation and selection (SZ2), and solution detailing (SZ3). Transformation abilities (TF) are outlined to be reliant on the activities of unfreezing (TF1), changing (TF2), and freezing (TF3) (Lewin 1951). SN, SZ, and TF are reflective constructs, measured using three items each.

Dynamic capability success (DC), here related to new service development, is captured using seven measurement items. As dynamic capabilities are repeated patterns of actions, they have to be used on a regular basis (DC1). Based on literature on creativity measurement (Dean et al. 2006), novelty is the degree to which an idea is original and breaks with currently prevailing paradigms (DC2). Relevance is the degree to which an idea will be effective in solving the stated problem. In our context of service innovation, we interpret the understanding of a stated problem as the requirement of the new service to fit in the corporative product strategy (DC3). Specificity is the degree to which an idea is clear and worked out in detail (DC4). Workability is the degree to which an idea can be easily implemented and doesn't violate known constraints (DC5). Additionally, successful service innovation is not only creative but also reactive and efficient. The organization is able to make quick transitions from first service ideas to implemented services (DC6) and relies on only minimal resource consumptions for new service development (DC7). Thus, DC is measured reflectively using seven measurement items.

Operational capability success (OC) is measured using the five quality dimensions from SERVQUAL (Parasuraman et al. 1988). First, physical equipment employed in the service process is considered (OC1). Second, the reliability of the services is assessed (OC2), i.e. the "ability to perform the promised service dependably and accurately" (Parasuraman et al. 1988). The third quality dimension is responsiveness, i.e. the willingness to serve customers and provide prompt service (OC3). Fourth, assurance is provided if the service personnel are knowledgeable and friendly and if they are able to inspire trust and confidence (OC4). Finally, empathy is a service provider's individualized attention for its customers while performing the service (OC5). Additionally, OC success is reflected by service process efficiency. We discriminate between service provision process efficiency (i.e. minimal

resource usage) from the view of a service provider (OC6) and the perspective of the service customer (OC7) (Parasuraman 2010). Hence, OC is a reflective construct measured with seven items.

To measure the strength of the collaboration between the focal organization and external partners we build upon Hahn et al. (2008), who measure the strength of collaborative ties “as a combination of the frequency of collaborative interactions and the closeness of the collaborative relationship.” This understanding is based on prior literature (e.g. Cummings & Kiesler 2007; Granovetter 2012). However, Hahn et al. relied on data of actual collaboration in open source software development projects. Hence, we developed new items for collaboration frequency (CSN1, CSZ1, CTF1) and closeness (CSN2, CSZ2, CTF2). These items are used to measure the corresponding constructs.

To measure technological assets we differentiate between IT support and collaborative IT support. For both asset types, we assess their utilization with the frequency of application (ITDC1, ITC1) (Thompson et al. 1991) and the satisfaction with applying them with overall user satisfaction (ITDC2, ITC2) (Petter et al. 2008). Frequency of application in terms of system use and satisfaction were selected as the two main variables of DeLone and McLeans IS Success Model (Petter et al. 2008). IT support and collaborative IT support are reflective constructs measured with two items.

Construct/Type	Definition	Items
Sensing Abilities (SN) (Basadur et al. 2000; Chai 2005; Teece 2009)	The service provider is capable of performing scanning, evaluating and detailing activities	SN1: We are capable to identify market opportunities for new services. SN2: We are capable to prioritize market opportunities appropriately. SN3: We are capable to elaborate most promising market opportunities in detail.
Seizing Abilities (SZ) (Stevens & Dimitriadis 2005; Teece 2009)	The service provider is capable of performing solution development, evaluation and selection, and detailing	SZ1: We are capable to develop alternative service concepts in response to identified market opportunities. SZ2: We are capable to select the best service concepts for further detailing and transformation. SZ3: We are capable to elaborate selected service concepts in detail.
Transformation Abilities (TF) (Lewin 1951; Teece 2009)	The service provider is capable of performing unfreezing, changing and freezing activities	TF1: We prepare our organization adequately for the introduction of new services (e.g. in abolishing barriers). TF2: We successfully introduce new service into our organization. TF3: After new service projects we assure conformity of service with the original service conceptualization.
Dynamic Capability Success (DC) (Dean et al. 2006; Teece et al. 1997)	Dynamic capability success is a combination of the creativity of new service concepts and the efficiency of the service development process	DC1: We frequently develop service concepts. DC2: We develop service concepts that represent radical market innovations. DC3: We develop service concepts that fit our corporate strategy. DC4: We develop detailed service concepts. DC5: We develop service concepts that can be implemented easily. DC6: We are capable in bringing new services to the market quickly. DC7: We develop new services with a high resource efficiency (labor time, financial resources, physical resources).
Operational Capability Success (OC) (Helfat & Peteraf 2003; Parasuraman et al. 1988; Parasuraman 2010)	Operational capability success is a combination of service quality and service process efficiency	OC1: We employ up-to-date equipment in service provision. OC2: We are always dependable in service provisioning, i.e. we conform with our customers' quality expectations. OC3: We promptly respond to customer requests on existing services. OC4: To our customers, we are a trustful service provider. OC5: We know the needs of our customers as regards existent services. OC6: Our services are optimized for minimal resource consumption. OC7: Our services are efficient from the perspective of our customers (e.g. quick and easy).
Strength of Collaborative Tie in Sensing (Sensing ties, CSN) (Hahn et al. 2008)	Sensing ties describes the strength of the collaborative tie of the organization in sensing.	CSN1: We communicate frequently with external partners when identifying market chances for new services. CSN2: The relationship to our external partners is trustful when we identify market chances for new services.
Strength of Collaborative Tie in Seizing (Seizing ties, CSZ) (Hahn et al. 2008)	Seizing ties describes the strength of the collaborative tie of the organization in sensing.	CSZ1: We communicate frequently with external partners when developing concrete alternatives for new services. CSZ2: The relationship to our external partners is trustful when we develop concrete alternatives for new services.
Strength of Collaborative Tie in Transformation (Transformation ties, CTF) (Hahn et al. 2008)	Transformation ties describes the strength of the collaborative tie of the organization in transformation.	CTF1: We communicate frequently with external partners when introducing newly developed services into our organization. CTF2: The relationship to our external partners is trustful when we introduce newly developed services into our organization.
IT-support for Sensing, Seizing, and	IT support is expressed by the utilization of and	ITDC1: We frequently use IT tools for developing new services (e.g. tools for brainstorming, process modeling, project management)

Transformation (IT support, ITDC) (Petter et al. 2008; Thompson et al. 1991)	satisfaction with IT	ITDC2: We are satisfied with the IT tools we use for developing new services
IT-Support for Collaboration with External Partners (Collaborative IT support, ITC) (Petter et al. 2008; Thompson et al. 1991)	Collaborative IT support is expressed by the utilization of and satisfaction with IT	ITC1: We frequently use IT tools to support the collaboration with our external partners in developing new services (e.g. collaborative document editing, as facilitated by MS Sharepoint) ITC2: We are satisfied with the IT tools we use to support the collaboration with our external partners in developing new services

Table 1. Constructs and items

To ensure that our item set was conform to “practitioners’ vocabulary”, all constructs and items were discussed with employees from several service organizations in late 2011. They made suggestions how to improve the wording of the items in order to avoid misspecifications.

4 Research Methodology

We compiled a questionnaire with the items as given in Table 1. We conducted a pilot study with the help of about 20 undergraduate and graduate IS students. This initial test led to minor adjustments to the items. In the beginning of 2012, we began to collect data together with a market research firm (100 valid answers, telephone interviews) from small and medium-sized enterprises (SMEs). We focused on SME for two main reasons: Firstly, much of the research on innovation has so far focused on larger firms, although SMEs are frequently considered as a prime source of future growth and innovation (McDermott & Prajogo 2012). Secondly, we also expect to achieve results of better reliability in SMEs due to practical considerations. From our previous experiences, persons responsible for service innovation appear to be identifiable and accessible more easily in SMEs as larger organizations tend to be spread the responsibility for service innovation across multiple persons and units and are generally more restrictive in giving insights into their innovation processes.

Our sample consists of answers from 100 SMEs out of the service sector including, e.g., IT services, healthcare, or financial services. The organizations had between 50 and 440 employees (mean: 159). Respondents were top managers (~35%), middle managers (~60%) or other employees (~5%). On average, they had about 21 years of professional experience. We analyzed the data using partial least squares (PLS) structural equation modeling (Ringle et al. 2012) as we have a small sample size and potentially non-normal data. The software to support our analysis was SmartPLS 2.0 (M3). (Ringle et al. 2005). We ran the PLS algorithm using the centroid weighting scheme, as the often used factor weighting scheme was shown to overestimate effects (Wilson & Henseler 2007). The few missing values in our data set were treated using mean replacement (Afifi & Elashoff 1966).

5 Results

Before analyzing our research model in detail, we conducted Harman’s one-factor test which led us to the conclusion that no common method bias exists (Cenfetelli et al. 2008). All constructs were analyzed with regards to construct validity and reliability, indicating only minor problems: Some of the item loadings (Table 2) are below .7. However, they are all highly significant as shown using bootstrapping (2,000 iterations). Construct validity of reflective constructs can be evaluated using the internal constancy reliability (ICR, Cronbach’s Alpha). Hinton et al. (2005) suggest accepting constructs with an ICR above .5. This is given for all our constructs (Table 2). With regard to convergent and discriminant validity, we rely on Fornell and Larcker (1981). They argue that the square root of the average variance extracted (diagonal elements in Table 3) should be higher than the correlations between the constructs (off-diagonal elements in Table 3). This is given for all constructs. Thus, although slight problems with regard to indicator reliability exist, the constructs are valid.

Const.	Item	IL	PV		Const.	Item	IL	PV		Const.	Item	IL	PV			
DC	DC1	.6391	.0000		SN	SN1	.8755	.0000		CSN	CSN1	.8278	.0000			
	DC2	.6530	.0000			SN2	.9366	.0000			CSN2	.8809	.0000			
	DC3	.6800	.0000			SN3	.8980	.0000		CSZ	CSZ1	.7521	.0000			
	DC4	.7661	.0000		SZ	SZ1	.8757	.0000			CSZ2	.9194	.0000			
	DC5	.7066	.0000			SZ2	.9213	.0000		CSF	CSF1	.7365	.0000			
	DC6	.7766	.0000			SZ3	.8808	.0000			CSF2	.9680	.0000			
	DC7	.6460	.0000		TF	TF1	.8483	.0000		ITDC	ITDC1	.8793	.0000			
OC	OC1	.6524	.0000			TF2	.8943	.0000			ITDC2	.8947	.0000			
	OC2	.6974	.0000			TF3	.8592	.0000		ITC	ITC1	.7415	.0000			
	OC3	.7460	.0000		Const. = Construct IL = Item Loading PV = p-Value						ITC2	.9374	.0000			
	OC4	.8102	.0000													
	OC5	.7053	.0000													
	OC6	.4883	.0000													
	OC7	.7540	.0000													

Table 2. Item Loadings and Item Weights

	ICR	Mean	SD	DC	OC	SN	SZ	TF	CSN	CSZ	CTF	ITDC	ITC
DC	.82	3.24	1.12	.70									
OC	.82	2.04	.71	.58	.70								
SN	.82	2.71	1.16	.70	.65	.90							
SZ	.80	2.75	1.24	.74	.60	.85	.89						
TF	.75	2.42	.96	.57	.52	.36	.44	.87					
CSN	.63	2.62	1.30	.34	.33	.35	.38	.27	.85				
CSZ	.60	2.55	1.19	.38	.39	.36	.39	.24	.77	.84			
CTF	.70	2.57	1.19	.24	.34	.27	.32	.26	.63	.75	.86		
ITDC	.73	2.76	1.29	.48	.36	.38	.43	.39	.40	.41	.19	.89	
ITC	.63	3.10	1.32	.38	.38	.35	.35	.29	.42	.54	.39	.58	.85

Table 3. Measurement Model

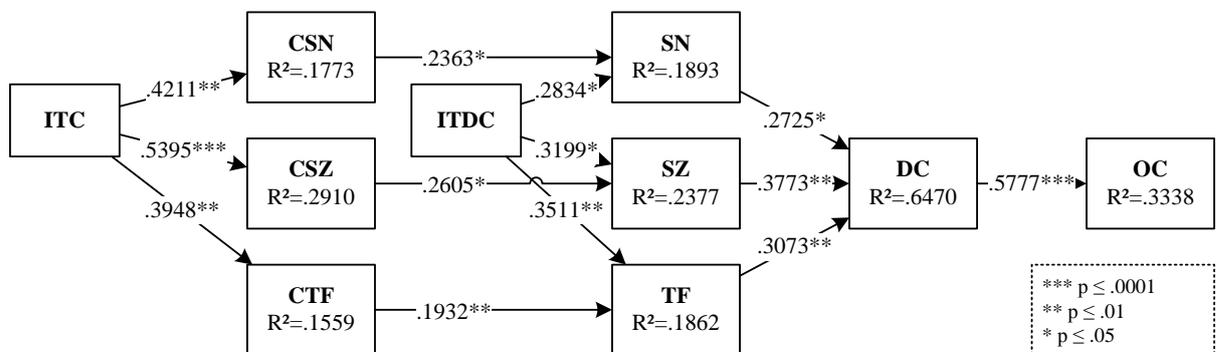


Figure 2. Verified Research Model

The coefficients of determination (R²) of our model are quite high. Especially, the service innovation success (DC) is explained substantially by the sensing, seizing and transformation abilities (SN, SZ, TF). All other R²-values are on a medium level. All of the hypothesized paths are significant (Figure 2). Notably, we can observe that service innovation success (DC) has a great influence on service success (OC) and that DC is influenced most by the seizing ability (SZ). IT support dedicated to service innovation (ITDC) has its strongest influence on the transformation ability (TF). The strength of collaborative ties has the strongest influence on seizing capabilities (relation between CSZ and SZ). Moreover, IT support for collaboration (ITC) has the highest influence on seizing ties (CSZ).

6 Discussion and Conclusion

The results indicate that service innovation success has a positive influence on the success of services. We also find evidence that sensing, seizing, and transformation abilities are very important antecedents of service innovation capability. Collaboration is important for all three abilities. We are also able to confirm the existence of significant positive impacts of IT use on these three abilities, indicating that IT support for these abilities is likely to result in better service innovation success. Precisely, IT support for collaboration (ITC) was found to have a positive impact on the strengths of collaborative ties during sensing, seizing and transformation (CSN, CSF, and CTF). There is also a positive relationship between the IT use for service innovation (ITDC) and the sensing, seizing and transformation abilities (SN, SF, and TF). Accordingly, we conclude that organizations can leverage the success of service innovation using IT. IT support seems particularly helpful for collaboration in seizing activities (path coefficient of .5395). We also find positive relationships between the strengths of collaborative ties in sensing, seizing and transformation and the corresponding organizational abilities. Again, the relationship in seizing is the highest, although only marginally different from the other abilities. We thus conclude that collaboration is beneficial for service innovation in the area of all three abilities and should be promoted accordingly by senior executives of small and medium-sized service firms, e.g., by setting appropriate (monetary or non-monetary) incentives for employees to collaborate with external stakeholders from early phases in service innovation efforts on. Concerning our conceptualization of service innovation, we observe that the abilities of sensing, seizing, and transformation largely explain overall service innovation success. The strongest relationship is between SZ and DC, highlighting that the success of service innovation is especially dependent on a proper service design, including solution development, detailing, evaluation and selection.

Reflecting on these results, we contribute a novel, comprehensive and empirically validated model to the academic discussion on IT and innovation. In particular, we analyze phenomena that have not been covered by previous research on service innovation in SMEs (McDermott & Prajogo 2012). We are able to highlight the positive influence that IT support and collaboration have on service innovation and service success and, thereby, contribute to a better understanding of service innovation in SMEs. The results also support that service innovation is rightfully understood as a dynamic capability dependent on sensing, seizing, and transformation abilities. Hence, in line with previous studies, our results reinforce that the DCT is a valuable theoretical lens for researching service innovation, a topic that has previously been considered to be “among the least understood topics in the service management and innovations literature” (Menor & Roth 2007). Comparing our results with those of previous studies we see that the conceptualization in the multiple-case study by Fischer et al. (2010) is similar to ours as they also distinguish between sensing, seizing and reconfiguration capabilities. The domain they cover, however, is different as they analyze manufacturers who increasingly complement their products with service offerings. In their conceptual paper, den Hertog et al. (2010) identify six capabilities for managing service innovation that can be partly mapped to our conceptualization of sensing, seizing, and transformation abilities. We also confirm Argawal and Selen (2009) – although their approach to the conceptualization of collaboration and service innovation differs from ours – who empirically found out that collaboration between stakeholders in service value networks generate dynamic capabilities that are needed for achieving innovation in services. In the limitations of their manuscript, they state that they did not cover the impact of ICT. We included this factor in our study. Hence, in conjunction with these previous studies, our study contributes to a growingly coherent understanding of service innovation as a dynamic capability. Furthermore, we consider the development of a new measurement model focusing on the role of sensing, seizing, and transformation abilities for service innovation as a valuable contribution to (a part of) academia in itself. We expect it to be useful for future studies on service innovation and to be adaptable to other fields in which dynamic capabilities are discussed, e.g., business process management (BPM) (Niehaves et al. 2011; Trkman 2010) or strategic management (Bowman & Ambrosini 2003). Taking the example of BPM, the measurement model could be adapted to allow for an analysis of the influence of IT (e.g.,

modeling tools and process engines) and collaboration on BPM success and process performance. Admittedly, the presented findings are subject to certain limitations which will be addressed in the subsequent steps of our research. First, the presented results base on a sample of 100 SMEs. Here, an extension to a higher number of respondents is planned as. This would lever the reliability of the results and allow for further detailed analyses, e.g., between different sectors or industries. Here, we plan to extend the data base with another 500 SMEs. Further extensions of the survey, covering also larger organizations, are also desirable and would offer the opportunity to explore differences in service innovation between smaller and larger organizations. Second, despite the good validity of our measurement model, the set of constructs may benefit from further refinements. Thirdly, as we used self-reporting, our data might be subject to halo effects in which certain judgments are biased by the overall perception of the firm. Here, we will think about also including more direct measurements of our constructs, if possible. Finally, our research also calls for design-oriented IS research in the medium run. Given the importance of seizing activities for service innovation and the corresponding need for collaboration and IT support, we see great potential in the development of innovative and useful IT tools for collaborative seizing that could further leverage service innovation in organizations.

References

- Abdi, F., Shavarini, S.K. and Hoseini, S. (2006). Glean Lean: How to Use Lean Approach in Service Industries. *Journal of Services Research*, 6 (S1), 191–207.
- Afifi, A.A. and Elashoff, R.M. (1966). Missing Observations in Multivariate Statistics: I. Review of the Literature. *Journal of the American Statistical Association*, 61 (315), 595–604.
- Agarwal, R. and Selen, W. (2009). Dynamic Capability Building in Service Value Networks for Achieving Service Innovation. *Decision sciences*, 40 (3), 431–475.
- Basadur, M. et al. (2000). Collaborative Problem Solving through Creativity in Problem Definition: Expanding the Pie. *Creativity and Innovation Management*, (March), 54–76.
- Bashein, B.J., Markus, M.L. and Riley, P. (1994). Preconditions for BPR success. *Information Systems Management*, 11 (2), 7–13.
- Bharadwaj, A. (2000). A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS Quarterly*, 24 (1), 169–196.
- Blomqvist, K. and Levy, J. (2006). Collaboration capability – a focal concept in knowledge creation and collaborative innovation in networks. *International Journal of Management Concepts and Philosophy*, 2 (1), 31–48.
- Bowers, M.R. (1989). Developing New Services: Improving the Process Makes it Better. *Journal of Services Marketing*, 3 (1), 15–20.
- Bowman, C. and Ambrosini, V. (2003). How the Resource-based and the Dynamic Capability Views of the Firm Inform Corporate-level Strategy. *British Journal of Management*, 14 (4), 289–303.
- Capaldo, A. (2007). Network Structure and Innovation: The Leveraging of a Dual Network as a Distinctive Relational Capability. *Strategic Management Journal*, 28 (6), 585–608.
- Cenfetelli, R.T., Benbasat, I. and Al-Natour, S. (2008). Addressing the What and How of Online Services: Positioning Supporting-Services Functionality and Service Quality for Business-to-Consumer Success. *Information Systems Research*, 19 (2), 161–181.
- Chae, B. (2012). An Evolutionary Framework for Service Innovation: Insights of Complexity Theory for Service Science. *International Journal of Production Economics*, 135 (2), 813–822.
- Chai, K.-H. (2005). A TRIZ-Based Method for New Service Design. *Journal of Service Research*, 8 (1), 48–66.
- Chatterjee, D., Pacini, C. and Sambamurthy, V. (2002). The Shareholder-Wealth and Trading-Volume Effects of Infrastructure Investments. *Journal of Management Information Systems*, 19 (2).
- Chesbrough, H.W. (2011). *Open services innovation: rethinking your business to grow and compete in a new era* John Wiley & Sons.
- Chesbrough, H.W., Vanhaverbeke, W. and West, J. (2006). *Open Innovation: Researching a New Paradigm*. H. W. Chesbrough, W. Vanhaverbeke, & J. West, eds. Oxford University Press.

- Cowell, D. (1988). New Service Development. *Journal of Marketing Management*, 3 (3), 296–312.
- Cummings, J.N. and Kiesler, S. (2007). Who Works With Whom? Collaborative Tie Strength in Distributed Interdisciplinary Projects. In *Proceedings of the 3rd International e-Social Science*. 1–9.
- Das, S.R. and Canel, C. (2006). Designing service processes: A design factor based process model. *International Journal of Services Technology Management*, 7 (1), 85–107.
- Dean, D.L. et al. (2006). Identifying quality, novel, and creative Ideas: Constructs and scales for idea evaluation. *Journal of the Association for Information Systems*, 7 (10), 646–699.
- Doherty, N.F. and Terry, M. (2009). The Role of IS Capabilities in Delivering Sustainable Improvements to Competitive Positioning. *The Journal of Strategic Information Systems*, 18 (2), 100–116.
- Dreu, D., Carsten, K.W. and West, M.A. (2001). Minority dissent and team innovation: the importance of participation in decision making. *Journal of Applied Psychology*, 86 (6), 1191–1201.
- Eisenhardt, K.M. and Martin, J.A. (2000). Dynamic Capabilities: What Are They? *Strategic Management Journal*, 21 (10-11), 1105–1121.
- Fischer, T. et al. (2010). Exploitation or Exploration in Service Business Development?: Insights from a Dynamic Capabilities Perspective. *Journal of Service Management*, 21 (5), 591–624.
- Fornell, C. and Larcker, D.F. (1981). Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics C. Fornell, ed. *Journal of Marketing Research*, 18 (3), 382–388.
- Granovetter, M.S. (2012). The Strength of Weak Ties. *Journal of Sociology*, 78 (6), 1360–1380.
- Grant, R.M. (1996). Prospering in Dynamically-Competitive Environments: Organizational Capability as Knowledge Integration. *Organization Science*, 7 (4), 375–387.
- Hahn, J., Moon, J.Y. and Zhang, C. (2008). Emergence of New Project Teams from Open Source Software Developer Networks: Impact of Prior Collaboration Ties. *Information Systems Research*, 19 (3), 369–391.
- Helfat, C.E. and Peteraf, M.A. (2003). The Dynamic Resource-Based View: Capability Lifecycles. *Strategic Management Journal*, 24 (10), 997–1010.
- Hertog, P. Den, Aa, W. Van Der and Jong, M.W. De (2010). Capabilities for Managing Service Innovation: Towards a Conceptual Framework. *Journal of Service Management*, 21 (4), 490–514.
- Hinton, P., Brownlow, C. and McMurray, I. (2005). *SPSS Explained*. 2nd Editio. Routledge Chapman & Hall.
- Johne, A. and Storey, C. (1998). New Service Development: A Review of the Literature and Annotated Bibliography. *European Journal of Marketing*, 32 (3/4), 184–251.
- Kleis, L. et al. (2011). Information Technology and Intangible Output: The Impact of IT Investment on Innovation Productivity. *Information Systems Research*, 23 (1), 42–59.
- Lewin, K. (1951). *Field theory in social science*. D. Cartwright, ed. Harper & Row.
- Liedtka, J.M., Bragg, W. and Hegarty, E. (2011). Collaborating across lines of business for competitive advantage. *The Academy of Management Executive*, 10 (2), 20– 37.
- Lusch, R.F., Vargo, S.L. and Tanniru, M. (2009). Service, value networks and learning. *Journal of the Academy of Marketing Science*, 38 (1), 19–31.
- McDermott, C.M. and Prajogo, D.I. (2012). Service innovation and performance in SMEs. *International Journal of Operations & Production Management*, 32 (2), 216–237.
- Melville, B.N. and Kraemer, K. (2004). Information Technology and Organizational Performance: An Integrative Model of IT Business Value. *MIS Quarterly*, 28 (2), 283–322.
- Menor, L.J. and Roth, A. (2007). New Service Development Competence in Retail Banking: Construct Development and Measurement Validation. *Journal of Operations Management*, 25 (4), 825–846.
- Menor, L.J., Tatikonda, M. V. and Sampson, S.E. (2002). New Service Development: Areas for Exploitation and Exploration. *Journal of Operations Management*, 20 (2), 135–157.
- Niehaves, B., Plattfaut, R. and Sarker, S. (2011). Understanding Dynamic IS Capabilities for Effective Process Change: A Theoretical Framework and an Empirical Application. In *Proceedings of the Thirty Second International Conference on Information Systems*. Shanghai, China.
- Oke, A. (2007). Innovation types and innovation management practices in service companies. *International Journal of Operations & Production Management*, 27 (6), 564–587.

- Parasuraman, A. (2010). Service Productivity, Quality and Innovation: Implications for Service-Design Practice and Research. *International Journal of Quality and Service Sciences*, 2 (3), 277–286.
- Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1988). SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality. *Journal of Retailing*, 64 .
- Pavlou, P.A. and Sawy, O.A. El (2010). The “Third Hand”: IT-Enabled Competitive Advantage in Turbulence Through Improvisational Capabilities. *Information Systems Research*, 21 (3), 443–471.
- Petter, S., DeLone, W. and McLean, E. (2008). Measuring Information Systems Success: Models, Dimensions, Measures, and Interrelationships. *European Journal of Information Systems*, 17 (3), 236–263.
- Plattfaut, R., Niehaves, B. and Becker, J. (2012). Capabilities for Service Innovation: A Qualitative Case Study in the Consulting Industry. In *Proceedings of the Proceedings of the 16th Pacific Asia Conference on Information Systems (PACIS)*. Ho Chi Minh City, Vietnam.
- Podsakoff, P.M. and Organ, D.W. (1986). Self-Reports in Organizational Research: Problems and Prospects. *Journal of Management*, 12 (4), 531–544.
- Pöppelbuß, J. et al. (2011). Service Innovation Capability: Proposing a New Framework. In *Proceedings of the Proceedings of the 3rd International Symposium on Services Science (ISSS 2011) in conjunction with the Federated Conference on Computer Science and Information Systems (FedCSIS 2011)*. Szczecin, PL.
- Ravichandran, T. and Lertwongsatien, C. (2005). Effect of information systems resources and capabilities on firm performance: A resource-based perspective. ... *Information Systems*, 21 (4), 237–276.
- Ringle, C.M., Sarstedt, M. and Straub, D. (2012). Editor’s Comments - A Critical Look at the Use of PLS-SEM in MIS Quarterly. *MIS Quarterly*, 36 (1), iii–xiv.
- Ringle, C.M., Wende, S. and Will, S. (2005). SmartPLS 2.0 (M3) Beta.
- Shostack, G.L. (1982). How to Design a Service. *European Journal of Marketing*, 16 (1), 49–63.
- Stevens, E. and Dimitriadis, S. (2005). Managing the New Service Development Process: Towards a Systemic Model. *European Journal of Marketing*, 39 (1/2), 175–198.
- Swanson, E.B. (1994). Information Systems Innovation Among Organizations. *Management Science*, 40 (9), 1069–1092.
- Teece, D.J. (2009). *Dynamic capabilities and strategic management: organizing for innovation and growth* Oxford University Press, USA.
- Teece, D.J. (2007). Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance. *Strategic Management Journal*, 28 (13), 1319–1350.
- Teece, D.J., Pisano, G. and Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, 18 (7), 509–533.
- Thomke, S.H. (2006). Capturing the Real Value of Innovation Tools. *MIT Sloan Management Review*, 47 (2), 24–32.
- Thompson, R.L., Higgins, C.A. and Howell, J.M. (1991). Personal Computing: Toward a Conceptual Model of Utilization. *MIS Quarterly*, 15 (1), 125–143.
- Trkman, P. (2010). The critical success factors of business process management. *International Journal of Information Management*, 30 (2), 125–134.
- Wade, M. and Hulland, J. (2004). Review: The Resource-Based View and Information Systems Research: Review, Extension and Suggestions for Future Research. *MIS Quarterly*, 28 (1), 107–142.
- Wilson, B. and Henseler, J. (2007). Modeling reflective higher-order constructs using three approaches with PLS path modeling: A Monte Carlo comparison. *Australian and New Zealand Marketing Academy ANZMAC Conference*, 791–800.
- Zammuto, R.F. et al. (2007). Information Technology and the Changing Fabric of Organization. *Organization Science*, 18 (5), 749–762.
- Zollo, M. and Winter, S.G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science*, 13 (3), 339–351.